

**Whiskey is for Drinkin'**  
**Water is for Fighting Over – M.Twain**





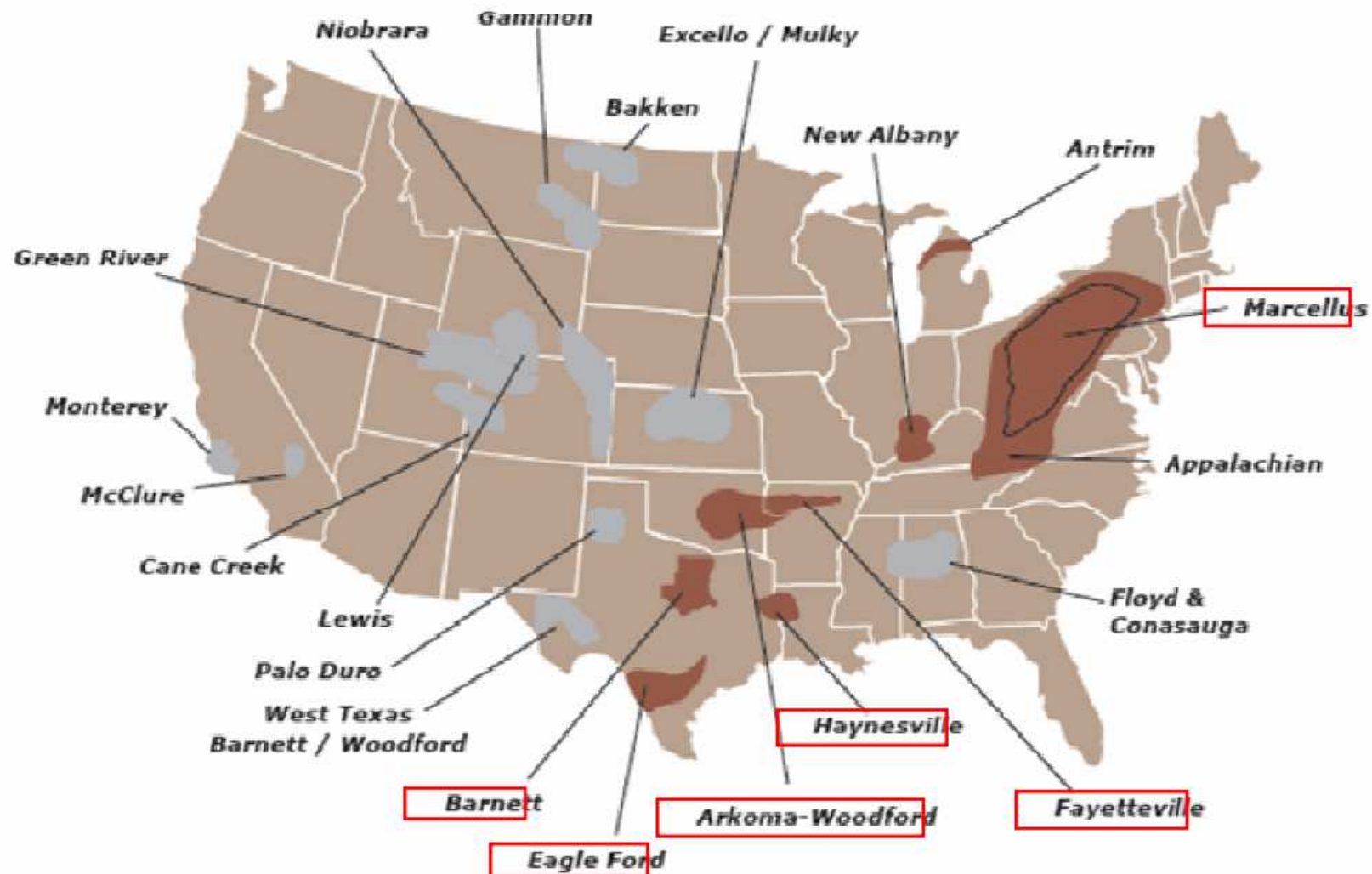
# **Hydraulic Fracturing,** **Misconceptions and Economics**

**BY**

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# U.S. Gas Shale Basins



**23** Significant Gas Shale Basins in U.S. - over **55,000** Producing Wells



# **Hydraulic Fracturing**

- **Hydraulic Fracturing (Fracing) is a safe, proven Technology and Provides needed income for landowners**
- **1st Frac jobs were in 1940s**
- **Technology has Advanced, Safer more Efficient**
- **Frac Zones are isolated by steel casing, cement and thousands of feet of impervious rock and clay.**





# Eagle Ford Shale ?

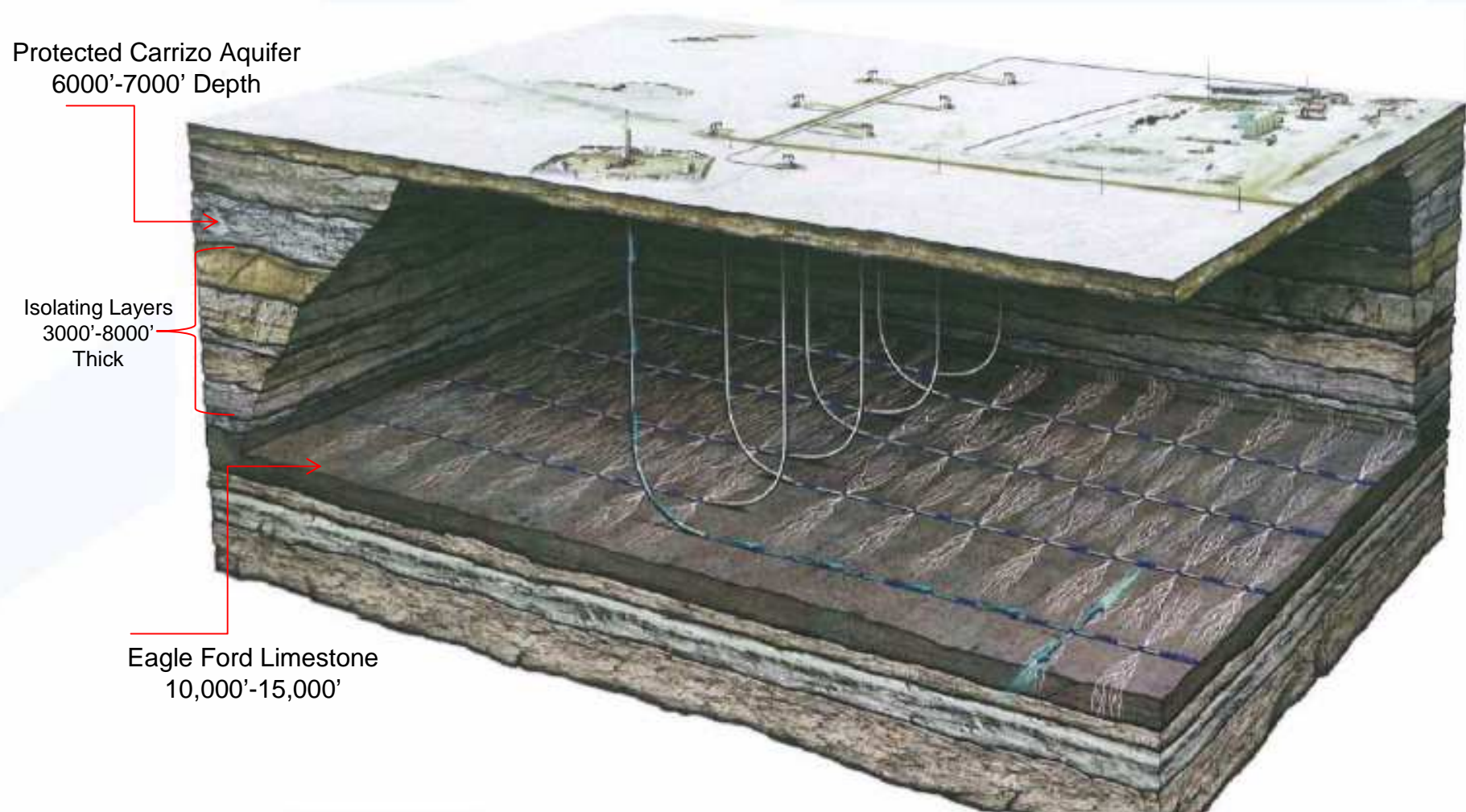


- Middle Cretaceous
- Basin Area = 3,800 mi<sup>2</sup>
- Rec. Reserves = 21 Tcf
- Depth = 10,500 – 11,300 ft
- Thickness = 300 – 475 ft
- Avg. Well IP = 6.0 MMcfd +cond/oil
- Horiz Laterals = 3,800 – 5,500 ft

**Source Rock**  
**NOT**  
**Reservoir Rock**



# Eagle Ford Lateral Well Pattern In “Layer Cake”





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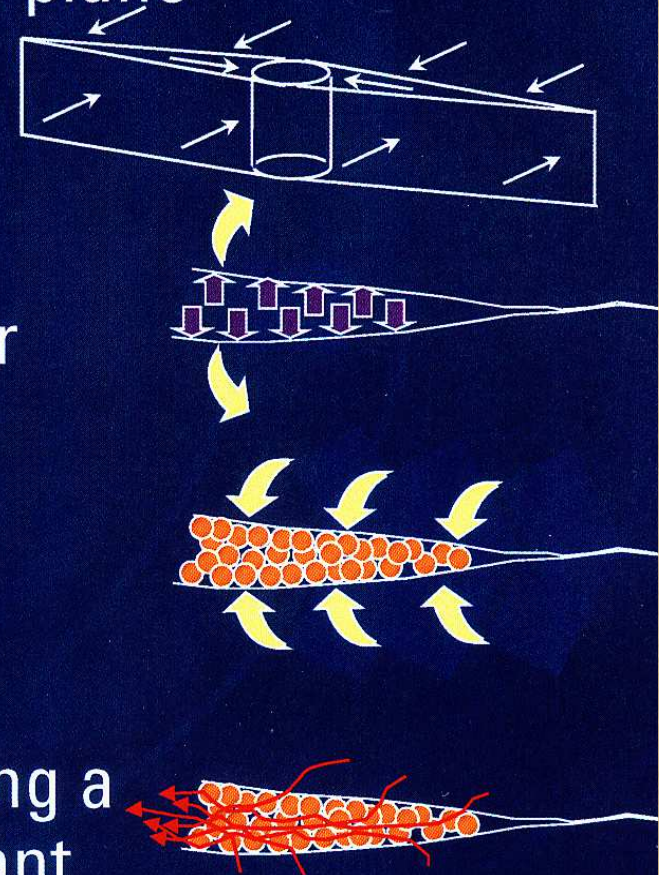


# What is Hydraulic Fracturing

- Objective: create a high conductivity plane with the reservoir

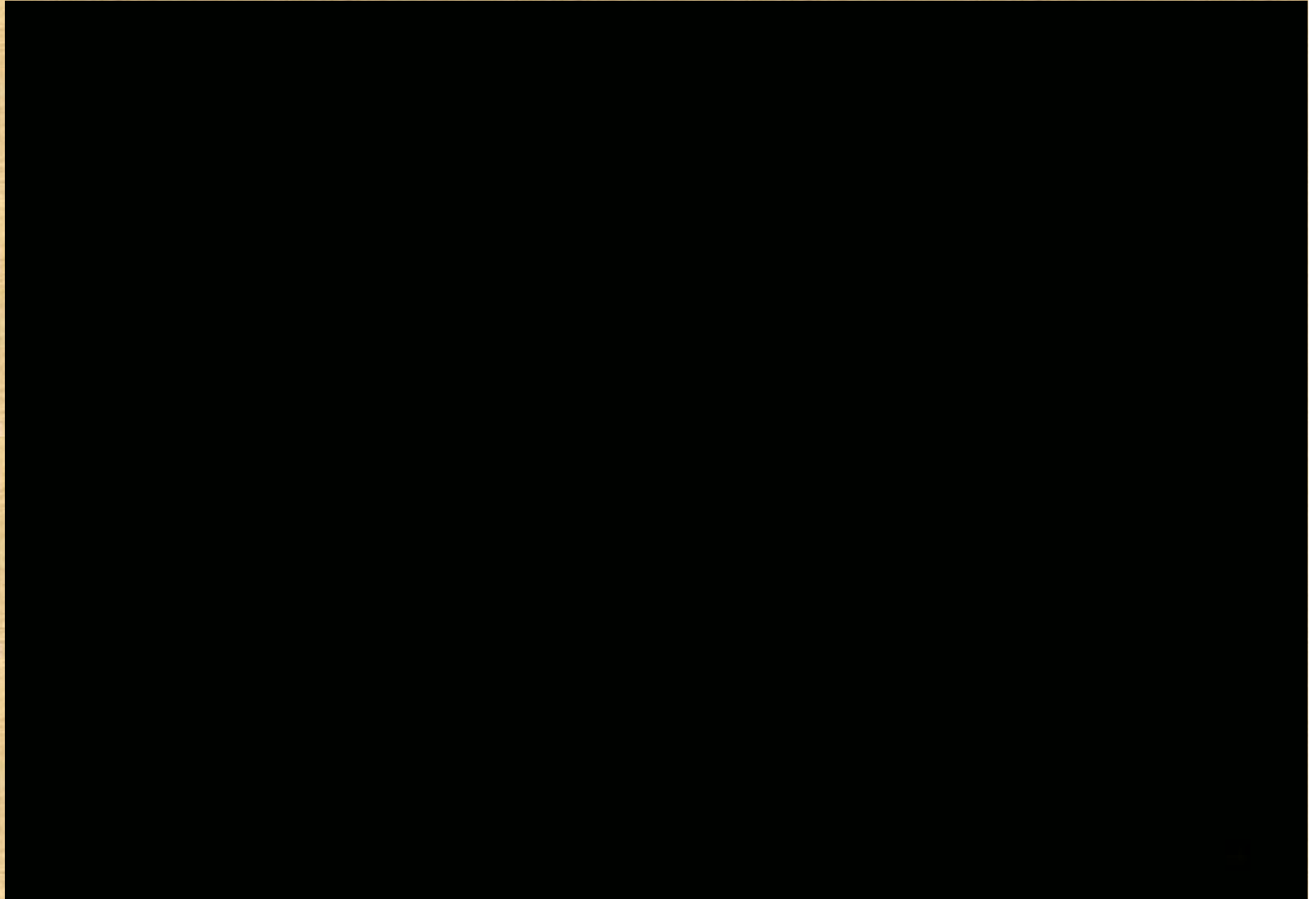
- The rock is split using the liquid lever principle

- The split or fracture is held open using a hard granular material called proppant



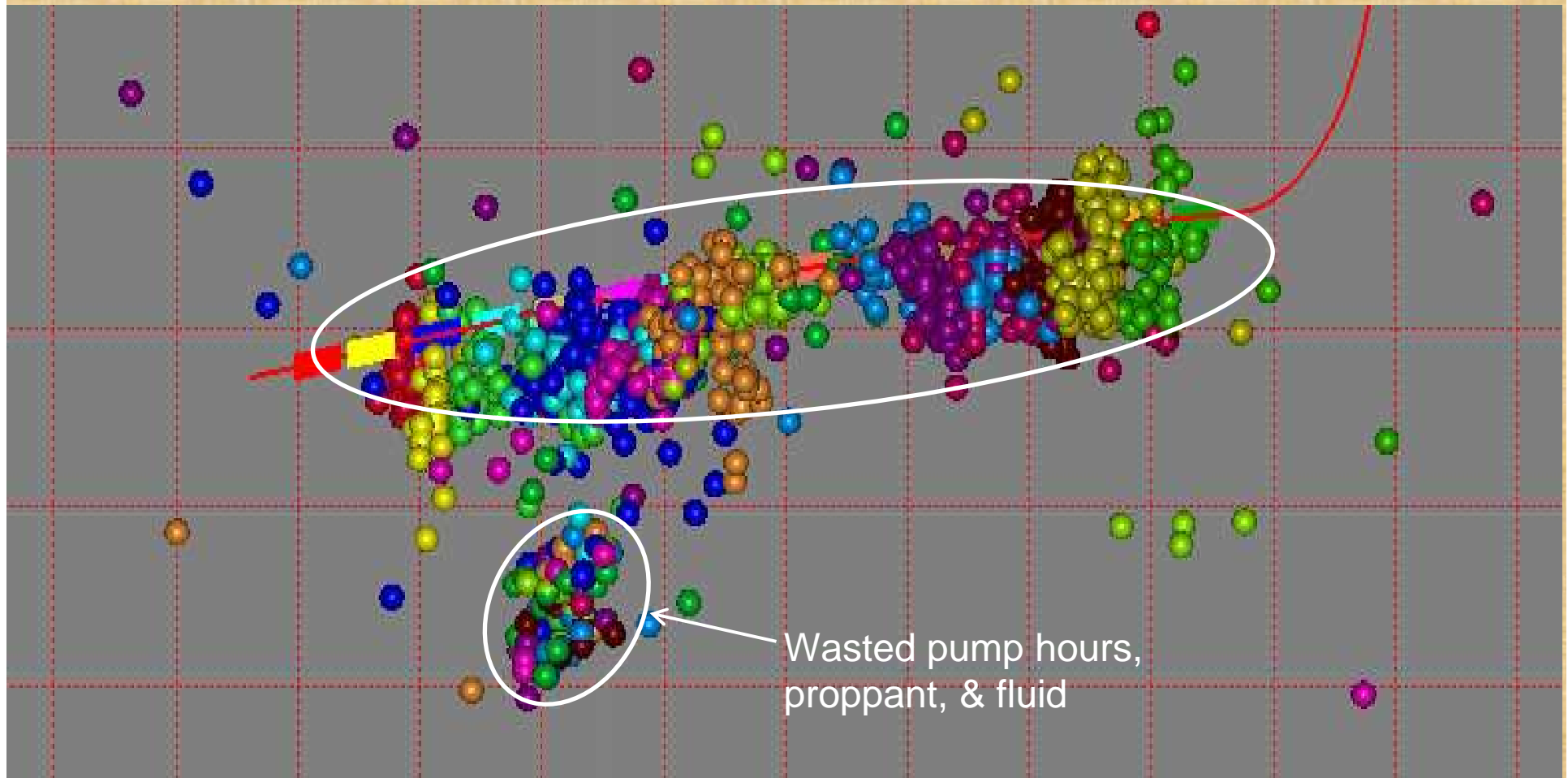


# FRAC JOB





## Encountering a Fault Zone - “Locked Strain”



Note: Frac Energy Goes DOWN a Fault Plane, not UP!!! **Why???**

Locked Strain Increases with Depth – Meaning Rocks Have a Greater Willingness to Break with Depth - Reduced Overburden Dissipates Strain and Increases “Peanut Butter” Response Upwards





# Water Use and Recovery

- **Typical Frac Job uses 3-10 m/gallons of water**
- **20-30% Recovery of Frac Fluid, some Reuse**
- **Golf Course uses 10 million gallons in a month or so**
- **Frac Job is a One time Use – Well can be converted to other uses, irrigation , livestock.**

# Landowner Economics

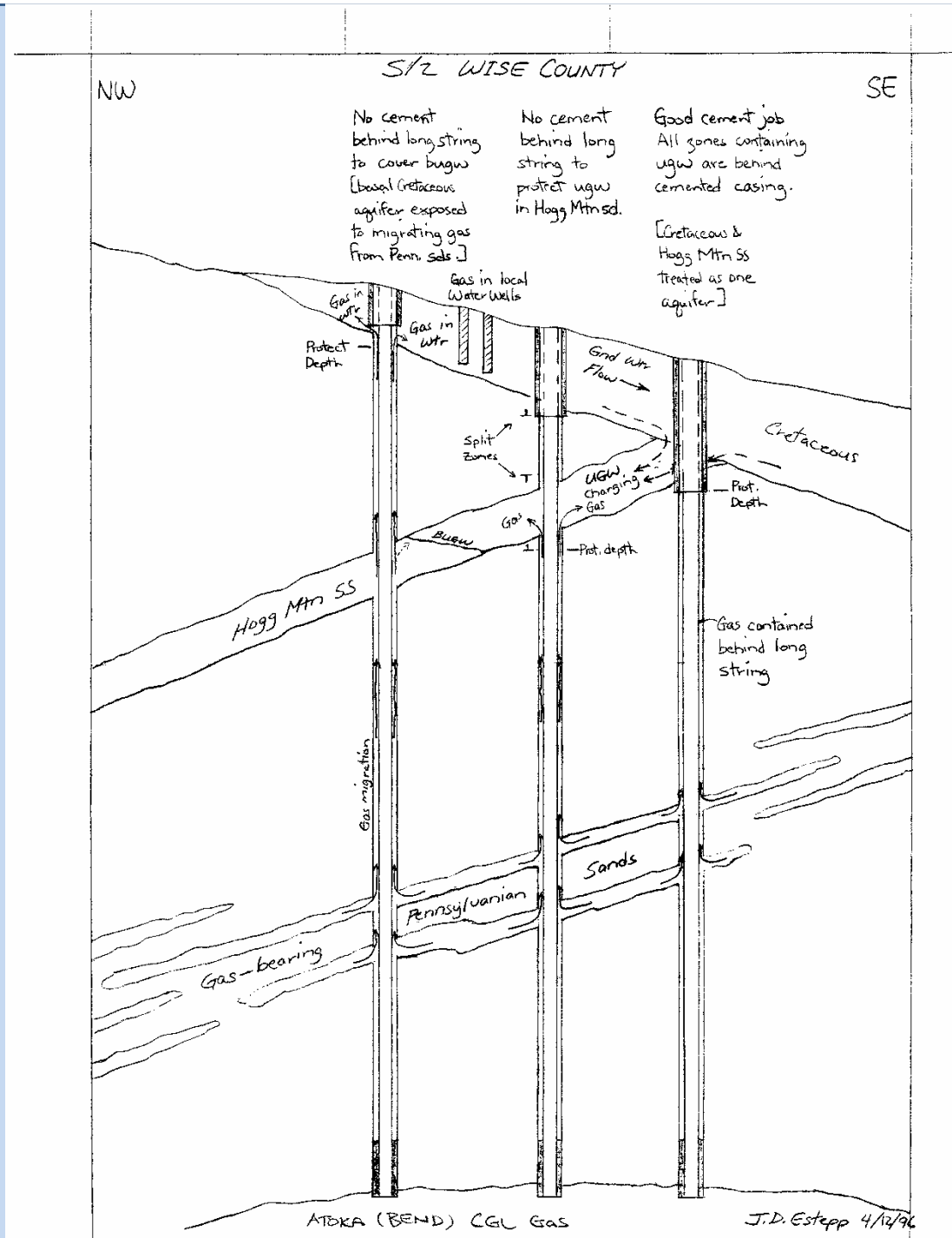
- Royalties From Surface and Mineral Rights
- Sell or lease Surface or Groundwater rights
- **40 cents to 70 cents/BBL- One BBl is equivalent to 42 gallons**
- Convert Frac water well to irrigation or stock



# **Groundwater Contamination**

1. **Natural Causes** – Formation Geology
2. **Bad Well Design** - Poor Cement Job
3. **Casing Failure**
4. **Surface Spills**
5. **Blow Out**

# Gas Contamination Pathways into Protected Groundwater







# Blow Out





# CONCLUSIONS

- Protected Groundwater is not impacted by a properly designed well and Frac Job.
- Water Demand for Fracing will decrease as technology advances
- **Fracing** Can be Lucrative for Landowners

[http://m.youtube.com/index?desktop\\_uri=  
%2F&gl=US#/watch?v=nvnnBcxhzNA](http://m.youtube.com/index?desktop_uri=%2F&gl=US#/watch?v=nvnnBcxhzNA)